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GEOGRAPHICAL AND GEOLOGICAL EXPLORATIONS AND SURVEYS WEST
OF THE ONE HUNDREDTH. MERIDIAN.

FIRST LIEUT. GEO. M. WHEELER, CORPS OF ENGINEERS, IN CHARGE.

PRELIMINARY REPORT

UPON

INVERTEBRATE FOSSILS

COLLECTED BY

THE EXPEDITIONS OF 1871, 1872, AND 1873,

WITH

DESCRIPTIONS OF NEW SPECIES

C. A. WHITE, M. D.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.

December, 1874.

With the Compliments of

Lieut. George M. Wheeler

Corps of Engineers,

U. S. Army.

ENGINEER DEPARTMENT, U. S. ARMY.

U.S.

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1874.

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BRUNSWICK, ME., November 26, 1874.

SIR: I have the honor to inclose herewith a preliminary report upon a part of the collection of invertebrate fossils made by the expedition under your command; and, in view of the fact that nearly all the species therein noted are new, I would respectfully suggest that it be published at as early a date as possible, in order that the expedition may receive due credit for priority of discovery in this most interesting branch of paleontology.

Very respectfully, your obedient servant,

C. A. WHITE.

Lieut. GEORGE M. WHEELER,
Corps of Engineers.

[INDORSEMENTS.]

UNITED STATES ENGINEER OFFICE,
EXPLORATIONS AND SURVEYS WEST OF THE 100TH MERIDIAN,
Washington, D. C., December 7, 1874.

Respectfully forwarded to the Chief of Engineers, with recommendation that the preliminary report upon invertebrate fossils herewith be published at the Congressional Printing-Office, at the earliest practicable moment, for the reason stated by Dr. White.

GEO. M. WHEELER,
Lieutenant of Engineers, in charge.

OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 12, 1874.

Respectfully submitted to the Honorable Secretary of War, with the recommendation that the report be printed at the Government Printing-Office, and that 1,500 copies be furnished on requisition from this Office.

A. A. HUMPHREYS,
Brigadier-General and Chief of Engineers.

Approved by the Secretary of War:

H. T. CROSBY,
Chief Clerk.

DECEMBER 15, 1874.

PRELIMINARY REPORT UPON THE INVERTEBRATE AND
OTHER FOSSILS; WITH DESCRIPTIONS OF NEW SPECIES
COLLECTED BY THE EXPEDITION FOR GEOGRAPHICAL
AND GEOLOGICAL EXPLORATIONS AND SURVEYS WEST
OF THE ONE HUNDREDTH MERIDIAN; LIEUT. GEORGE
M. WHEELER, CORPS OF ENGINEERS, UNITED STATES
ARMY, IN CHARGE.

By C. A. WHITE, M. D.

LOWER SILURIAN.
PRIMORDIAL PERIOD.*†
PLANTS.

Genus CRUZIANA d'Orbigny.

CRUZIANA LINNARRSONI (*sp. nov.*)—Body not much flattened, oblong or subelliptical in outline, but narrowed and more or less pointed at the ends, one of which is more acutely pointed than the other. Median furrow extending the whole length of the body, the greater part of it being moderately deep and distinct; surface showing few or no transverse rugæ, but upon the more pointed end of some of the specimens there is a secondary furrow upon each side of the median furrow; these extend to the point where they join the median furrow, but disappear in the other direction before reaching the middle of the body. Stipe rather small, attached about mid-length in the bottom of the median furrow, but it is not usually seen attached, having been lost or destroyed.

Length of body, from two and a half to seven and a half centimeters.

It is thought possible that the specimens of this species may have been denuded of rugæ before they became imbedded, because some of the slabs upon which the specimens are found are strewn with small bodies that resemble detached rugæ; on the other hand, this seems improbable, because some of these slabs are found to contain both *C. Linnarrsoni* and the following species, the former being nude as usual, and the latter having their abundant rugæ in place.

Position and locality.—Tonto Shale, Grand Cañon of the Colorado River, Mohave County, Arizona Territory.

CRUZIANA RUSTICA (*sp. nov.*)—Body more or less elongated, flattened, more or less distinctly bilobed, the ends being blunt; median furrow extending the whole length of the body, comparatively shallow and uniform throughout. Transverse rugæ numerous, distinct, extending from the sides to the middle of the median furrow, and arching slightly as they cross the lobes.

* The nomenclature of the geological periods adopted in this paper is that of Dana's New Manual of Geology, 1874.

† I am under obligations to Professor Joseph Henry, Secretary of the Smithsonian Institution, for the free use of all the facilities possessed by it to aid me in my investigations.—C. A. W.

Length of the body in proportion with the width variable; in some specimens (perhaps broken ones) the length and width being about equal, while in others the length is two or three times as great as the width. The width, in different specimens, varies from three and a half to upward of four centimeters.

Position and locality.—Same as the last.

BRACHIOPODA.

Genus ACROTRETA Kutorga.

ACROTRETA ? SUBSIDUA (*sp. nov.*)—Shell thin, corneous, discoid, subcircular or slightly suboval in outline, the transverse diameter being a trifle greater than the longitudinal; sides regularly and front broadly rounded; posterior margin slightly straightened, forming a comparatively short, slightly convex, or nearly straight hinge-line. Dorsal valve nearly flat; beak marginal, not prominent. Interior with a slightly-raised median ridge, beginning beneath the beak, and extending to about the middle of the valve, where it disappears; impressions of the posterior adductor muscles small and placed nearly beneath the beak, one on each side of the median ridge; between these muscular impressions and the posterior margin there is, at each side, an obscure diverging ridge or fold.

Ventral valve moderately convex in the umbonal region, but more flattened anteriorly; apex excentric, somewhat prominent and minutely perforate; adductor impressions small and placed in the apex close to the foramen, one at each side of it. One of the specimens shows a slight flattening of the triangular space between the apex and the hinge-line, which appears like an indistinctly-defined cardinal area.

This shell differs so widely in shape from the typical forms of *Acrotreta*, although it seems to possess its other essential characteristics, that I have referred it only provisionally to that genus.

Length of the largest specimen, six millimeters; width, seven millimeters.

Position and locality.—Strata probably of the epoch of the Potsdam Sandstone, Antelope Spring, House range, Utah.

Genus TREMATIS Sharpe.

TREMATIS PANNULUS (*sp. nov.*)—Shell small, subcircular; ventral valve moderately convex; apex prominent, excentric; surface marked by a very fine net-work of oblique, raised lines, dividing it up into minute four-sided pore-like pits, which cause it to resemble, under a lens, finely-woven cloth.

Diameter of the valve, about three millimeters.

Position and locality.—Shales of the Potsdam epoch, Pioche, Nevada.

PTEROPODA.

Genus HYOLITHES Eichwald.

HYOLITHES PRIMORDIALIS Hall ?—The collection contains specimens of a *Hyolithes* from the shales of the Potsdam epoch at Pioche, Nev., that seem to differ too little from *H. primordialis* Hall, from the strata of the same epoch in Wisconsin, to warrant a full specific separation from it.

CRUSTACEA.

Genus AGNOSTUS Brongniart.

AGNOSTUS INTERSTRICTA (*sp. nov.*)—Head and pygidium of almost exactly equal size and shape, and otherwise closely resembling each other. Head a trifle broader than long, regularly rounded in front; sides at the postero-lateral regions subparallel; postero-lateral angles truncated; the whole exterior margin, including the truncated portions just named, provided with a narrow, raised rim, forming a narrow, linear depression between it and those portions of the head which it incloses; space between this linear depression or furrow and the glabella a little wider posteriorly than it is in front, convex, the surface apparently smooth. Glabella conical, widest posteriorly, moderately convex; sides nearly straight, well defined by the dorsal furrows, sharply rounded in front, a minute tubercle on the median line near the back end, and a shallow furrow extending across near the front end.

Thorax narrower than the head and pygidium, giving the body the appearance of being constricted at the middle; axial lobe broad, both its segments tumid at the ends where they reach the dorsal furrows; lateral lobes very narrow, pleurae about as wide as long, each pleura tumid and rounded at its exterior end.

Pygidium with its outline like that of the head, and provided also with a similar raised marginal rim and furrow; axial lobe a little longer than the glabella, and consequently reaches a little nearer the posterior margin of the pygidium than the glabella does to the anterior margin of the head, moderately convex; sides curving a little outward, provided with a minute tubercle on the median line near the anterior end, corresponding with the one on the glabella; space between the dorsal furrows and the marginal furrow convex, apparently smooth. Upon the outer edge of the border of the pygidium, on each side, a little nearer to the axial extremity than to the antero-lateral angles, there is a minute protuberance suggestive of an incipient spine.

Length of body, eight millimeters; width of head, five millimeters; width of pygidium, same as head.

Position and locality.—Shales of the Primordial period at Antelope Spring, House range, Utah.

Genus OLENELLUS Hall.

OLENELLUS GILBERTI Meek (manuscript).*—Head subsemicircular or semi-oval, the length being from one-half to two-thirds as great as the width; both the external and posterior margins bordered by a narrow, continuous, slightly-raised rim, placed a little within the edge of the margins; the postero-lateral angles produced into slender spines, which are terete, not widened at the base, and, in the specimens, are about equal in length to one quarter of the transverse diameter of the head at its base. Near the postero-lateral angles of the head, the posterior margin bends abruptly forward, forming a kind of notch or small retreating angle with the backward-projecting spine, giving the outer corner of the movable cheek the appearance of being rounded. Eyes narrow, broadly arching outward, narrowness and convexity of curve both increasing posteriorly; their outer margins about equidistant from

* The descriptions of this and the following species were written by Mr. Meek before my own were, and now form a part of Mr. Gilbert's report to Lieutenant Wheeler, which is awaiting publication.—C. A. W.

the center and outer margin of the head, which distance is also about equal to the length of the eye. Glabella distinctly lobed, the furrows extending nearly or quite to its center; frontal lobe prominent, tumid, regularly rounded in front, and a little wider than the remainder of the glabella.

The remainder of the body is unknown except a single specimen of the long third pleura of the right side and another short one. Both of these are grooved and marked as is usual in the genus.

This species is nearly allied to *O. Vermontana*, the type specimens of which are from strata of the Potsdam epoch in the town of Georgia, Vt.

Position and locality.—Rocks of the Potsdam epoch at Pioche, Nevada.

OLENELLUS HOWELLI Meek (manuscript).—Head semi-oval in outline, strongly convex, the length on the median line being to the greatest breadth about as three to five; exterior margin having a strong raised border of nearly uniform width all around, and which is also continuous with the moderately strong spines of the postero-lateral angle of the head; length of the spines equal to about one-half the length of the head on the median line; posterior margin also with a raised border, extending on each side from the occipital segment to the base of the spines; width of this border not uniform like that of the exterior margin, but is widest a little beyond the midlength of each side, and narrowest near the base of each spine, where it again suddenly widens outward, blending with both the spine and the lateral border. This widening of the border there rounds the angle between the posterior margin and the spine, and also rounds the postero-lateral angle of that portion of the cheek which is inclosed within the raised borders. A shallow, linear depression runs around the head, just within the raised border, giving the broad cheek-surfaces the appearance of being slightly inflated. Eyes large, very prominent, extending from opposite the anterior furrow of the glabella to nearly opposite the middle of the occipital lobe; the palpebral lobe of each eye blending with the outer ends of the anterior, middle, and posterior lobes of the glabella.

Glabella large, very prominent, distinctly lobed; the furrows, especially the occipital one, not extending quite to the center on either side; the occipital and posterior lobes of about equal size; the middle and anterior ones about equaling each other in size, a little smaller than the two first named; frontal lobe large, tumid, extending forward to the shallow, linear depression just within the raised border of the head, regularly rounded in front, a little wider than the remainder of the glabella, bordered on each side by a shallow, linear depression, which ends anteriorly in the marginal depression just named.

Surface apparently smooth. Remainder of the body unknown.

This species is related to *O. Thompsoni* from strata of the Potsdam epoch in the town of Georgia, Vermont.

As the genus *Olenellus* is held by geologists to mark a distinct and characteristic horizon in American strata, its discovery in that distant locality is peculiarly interesting. It is also an interesting and significant fact that the two species here described respectively represent in their specific characters the two originally-described species of the genus found associated in the primordial rocks of Vermont and Canada, as these are found associated in rocks of the same period in Nevada.

The specimens from which the descriptions of the two species of *Olenellus* herein recorded were made are the same that were used by Mr. Meek in his original descriptions and naming of the species.

Position and locality.—Rocks of the Potsdam epoch, Pioche, Nevada.

CANADIAN PERIOD.

HYDROZOA.

Genus *PHYLLOGRAPTUS* Hall.

PHYLLOGRAPTUS LORINGI (*sp. nov.*)—Stipe apparently having the usual quadripartite form of the genus, the foliate expansion having a somewhat irregular elongate-oval outline and a moderately narrow axis; cellules leaving the axis at different angles with it in different parts of its length, ascending along the middle portion so as to form an acute angle with the axis and sweeping outward with an increasing curvature to the lateral margins, where they are at right angles with the axis, or, in some cases, slightly recurving. Toward the apex the cellules are less curved and form more acute angles with the axis. Each cellule gradually but slightly increases in size as it passes outward to the margin, where there are thirteen or fourteen in the space of a centimeter. Each cellule is provided at its aperture with a strong, prominent, recurving, lower lip, the edges of which, in our specimen, it being compressed, have the appearance of spine-like appendages. Being broken, also, at the lower end, its form there, and the full length, are not accurately known; but the full length was apparently about four centimeters; width, at about midlength, one and a half centimeters.

Dedicated to the memory of Mr. F. W. Loring, who was murdered by the Apache Indians in October, 1871, while a member of one of the exploring parties.

Position and locality.—Strata of the age of the Quebec group, Fish Spring, House range, Utah.

BRACHIOPODA.

Genus *ACROTRETA* Kutorga.

ACROTRETA PYXIDICULA (*sp. nov.*)—Shell minute; marginal outline subcircular or transversely suboval, without observable mesial sinus or fold. Dorsal valve moderately convex, most prominent near the umbo; beak small, depressed but well defined, hardly projecting beyond the hinge-line; cardinal angles rounded; hinge-line short, nearly straight; lateral and front margins regularly rounded. Ventral valve obliquely depressed-subconical; apex acute, prominent, and perforated by a minute foramen; margin in front of the hinge-line regularly rounded; area small, triangular, nearly flat, the angles it forms with the sides of the shell rounded.

Surface of both valves smooth or marked by very fine concentric lines of growth.

Width, two millimeters; length, a little less; height, a little less than the length.

This species seems to possess all the generic characteristics of *Acrotreta*, except that the ventral valve is not so much elevated as is usual in that genus.

Position and locality.—Strata of the age of the Quebec group, Schellbourne, Schell Creek range, Nevada.

Genus *LINGULA* Bruguière.

LINGULA ? MANTICULA (*sp. nov.*)—Shell small, elongate-subovate or subelliptical, broadest at or a little behind the midlength; beaks

pointed. Dorsal valve proportionally wider than the ventral, moderately convex; postero-lateral margins nearly straight, meeting at the beak at an angle of nearly forty-five degrees; beak small, depressed front margin regularly rounded; sides broadly rounded or only a little convex. Ventral valve proportionally longer than the dorsal in consequence of the projection of its beak behind that of the dorsal valve; the portion in front of the hinge corresponding with that of the other, except that the posterior part of it is a little more convex transversely. The beak is somewhat more prominent, more acute, and the postero-lateral slopes less straight than they are in the dorsal valve. Surface of both valves with a smooth appearance, but fine concentric lines and obscure radiating striae are visible under a lens.

Position and locality.—Strata of the age of the Quebec group, Schellbourne, Schell Creek range, Nevada.

Genus STROPHOMENA Rafinesque.

STROPHOMENA FONTINALIS (*sp. nov.*)—Shell moderately concavo-convex or nearly flat; outline semi-elliptical; width from one-quarter to one-third greater than the length; width at the hinge-line varying from a trifle more to a trifle less than it is just in front of it. Ventral valve somewhat flattened, but moderately convex, in the middle and umbonal region. Dorsal valve slightly concave, and in other respects corresponding with the ventral. Hinge and interior of both valves unknown.

Surface of both valves marked by fine, uniform, rounded, radiating striae, which increase by bifurcation, and give the surface an appearance very similar to that of the well-known *Strophomena fragilis* of the Devonian strata of New York and other States. Fine concentric striae are also visible under a lens.

Length, eighteen millimeters; width, twenty-four millimeters.

Position and locality.—Strata of the age of the Quebec group, Fish Spring, House range, Utah.

GASTEROPODA.

Genus BELLEROPHON Montfort.

BELLEROPHON ALLEGORICUS (*sp. nov.*)—Shell not above medium size, rather compact, umbilicated; aperture expanded, greatest expansion at the sides giving it a reniform outline; outer volution regularly convex transversely; lip with a moderately large, deep notch in front, of uniform width, and rounded at the back end; continuous with this notch, there is an equally broad, slightly-elevated, rounded dorsal band, extending along the center of the outer volution until it enters the aperture.

Surface-markings not preserved in any of the specimens.

Extreme width across the aperture, eighteen millimeters; postero-anterior diameter of the outer volution, seventeen millimeters.

Position and locality.—Strata of the age of the Quebec group, Fish Spring, House range, Utah.

CEPHALOPODA.

Genus ORTHOCERAS Breynius.

ORTHOCEERAS COLON (*sp. nov.*)—Shell annulated, very slightly tapering; section oval; siphuncle large, marginal, in contact with one of the

broadly-rounded sides, its diameter equal to one-third of the short diameter of the shell; septa smooth, convexity nearly uniform, reaching farther forward at the narrower sides than at the broader ones; annulations broadly rounded, passing sinuously around the shell, the sinuosity being greater upon one of the broad sides than upon the other; interspaces corresponding nearly in width and curvature with the annulations.

The shell-substance is not preserved upon the specimen, and the surface-markings are unknown.

Long diameter, eighteen millimeters; short diameter, fifteen millimeters; distance from center to center of the annulations, six millimeters.

Position and locality.—Strata of the age of the Quebec group, Fish Spring, House range, Utah.

CRUSTACEA.

Genus LEPERDITIA Rouault.

LEPERDITIA BIVIA (*sp. nov.*)—Shell not quite equivalve, inflated, the greatest transverse diameter being about midlength and below the middle; obliquely subovate in outline, widest anteriorly; the straight hinge-line about equal in length to two-thirds of the entire length of the shell, and ending, both posteriorly and anteriorly, in a small, distinctly projecting angle, which it forms with the anterior and posterior borders respectively; anterior margin obliquely rounded, with a moderately broad, somewhat flattened border; posterior margin abruptly rounded, having a similar, but rather narrower, laterally flattened border, the flattening of the borders of both valves and at both ends becoming obsolete upon reaching the ventral margin, which is broadly rounded. Ventral border of the right valve bent sharply inward and even a little upward, producing a narrow, plain, area-like surface there, which tapers to a sharp point at each extremity, and is nearly equal in length to the hinge-line. Ventral border of the left valve not bent inward like that of the right, but the general convexity of the valve extends to the edge; upon the ventral border of this valve, near its edge, there are two distinct, comparatively large pores which open divergently upon the surface, the distance between them being equal to a little more than half the length of the hinge-line.

Eye-tubercle not detected; surface apparently smooth.

Position and locality.—Strata of the age of the Quebec group, Queen Spring Hill, Schell Creek range, Nevada.

Genus MEGALASPIS Angelin.

MEGALASPIS BELEMNURUS (*sp. nov.*)—Pygidium subtriangular in outline, moderately convex transversely and only slightly convex longitudinally; length, compared with the width across the anterior end, about as fifteen to twenty-two; outer margins with a wide, smooth border, slightly convex, except near the antero-lateral angles, where the convexity increases and the angles are abruptly rounded; anterior margin moderately convex; posterior extremity ending in a spine-like process; segmentation indistinct, but most apparent upon the anterior portion of the axis; trilobation somewhat obscure; axis depressed, slightly higher than the adjacent portions of the lateral lobes, only about half as wide anteriorly as one of the lateral lobes, continuous posteriorly with the elevated caudal portion of the pygidium, which

terminates in the caudal spine; dorsal furrows moderately distinct upon the anterior half of the pygidium, but become obsolete posteriorly; lateral lobes slightly convex, indistinctly defined externally by the broad, nearly flat, marginal border; their inner sides more clearly defined, especially their anterior portions, by the dorsal furrows.

Surface apparently smooth. Remainder of the body unknown.

The species differs, from *M. goniocercus* Meek, in the less distinctly triangular outline of the pygidium, its greater proportionate width, the proportionally narrower axis, and the more distinct dorsal furrows.

Position and locality.—Rocks of the age of the Quebec group, Queen Spring Hill, Schell Creek range, Nevada.

Genus DICELLOCEPHALUS OWEN.

DICELLOCEPHALUS FLAGRICAUDUS (*sp. nov.*)—Pygidium contracted, fan-shaped; lateral lobes each consisting of three segments, directed backward; the inner one of each side lying close to the dorsal suture, nearly parallel with the axis of the body, or converging a little posteriorly, and becoming obsolete upon each side of a small but comparatively wide sloping border, that passes around the posterior end of the axial lobe. The middle segments commence at the dorsal furrow of each side respectively, near the anterior end of the pygidium, pass backward parallel with the first, and project beyond the border as converging posterior spines. The third and outer segments commence anteriorly at the dorsal sutures, where they are very narrow, extend outward, curve abruptly backward, parallel with the others, form raised lateral margins of considerable but unequal width to the pygidium, and project posteriorly as an outer pair of converging spines, similar to the others. Axis prominent, especially at its apex, where it terminates in a moderately sharp angle, about one-quarter wider anteriorly than posteriorly, well defined by the nearly straight dorsal furrows, marked by five or six distinctly-defined segments, which cross it almost transversely but with a slightly sinuous course.

The pygidium only of this species has been discovered, consequently its generic relations are not accurately known, and it is referred only provisionally to *Dicellocephalus*.

Position and locality.—Strata of the age of the Quebec group, Schellbourne, Schell Creek range, Nevada.

TRENTON PERIOD.

HYDROZOA.

Genus GRAPTOLITHUS Linnaeus.

GRAPTOLITHUS (DIPLOGRAPTUS) HYPNIFORMIS (*sp. nov.*)—Stipe simple, slender; sides flat; edges nearly straight and nearly parallel, the increase in width being very slight from the proximal or basal end toward the distal end. Serratures deep, narrow, sharply rounded or angular at bottom, the inner and outer sides both rising at acute angles with the axis of the stipe, those of adjacent cells joining together to form moderately long, slender, mucronate points, directed strongly upward, between the cells. At the proximal end of the stipe, small downward-diverging points are sometimes seen, like those of *G. Whitfieldi* Hall, and other allied species; and, like those species, this has a slender, thread-like axis, passing longitudinally through the center of the stipe and

extending more or less beyond the distal cells. Serratures, or cells, about twelve in the length of a centimeter.

Extreme width of the stipe between the mucronate points of each side often less than two millimeters and seldom more; length of stipe, from one to three centimeters.

Position and locality.—Shales (probably of the age of those at Norman's Kill, near Albany, New York), five miles north of Belmont, Nevada, where it is associated with the two following species.

GRAPTOLITHUS QUARDRIMUCRONATUS Hall?—Stipe quadrilateral; section oblong, gradually but slightly increasing in transverse diameter from the proximal or basal end to about midlength, where the maximum size is reached; cells opening on the two narrower sides; their apertures directed obliquely upward, narrow, transverse, like four-sided slits, of uniform size, about half the width of the interspaces, their length nearly equaling the full short diameter of the stipe. At each of the two outer corners of each cell-aperture, a mucronate point projects, which, together with the slight projection of the cell itself from the body of the stipe, gives the latter a doubly-serrated appearance, when viewed upon one of its broader sides, like that of two stipes of an ordinary *Diplograptus* compressed together. A slender, thread-like axis, passing longitudinally through the middle of the stipe, usually appears as a part of the imprint of the specimens upon the shale.

This species, so far as can be determined from the specimens, is so closely like *G. quadrimucronatus* Hall, from the "Utica-slate formation, Lake St. John, east of Blue Point," that it is referred provisionally to that species. In case more perfect specimens should show the species to be new, as it probably is, I propose for it the name of *G. Belmontensis*.

Position and locality.—Shales (probably of the age of those at Norman's Hill, near Albany, New York), five miles north of Belmont, Nevada, where it is associated with the last-described species, and also with the following one.

GRAPTOLITHUS (CLIMACOGRAPTUS?) RAMULUS (*sp. nov.*) Stipe slender, bifurcating, bearing cells upon both edges below the bifurcation, and upon only one edge, the outer, above that point, so that each series of cells is continuous from the common proximal to the two distal extremities respectively, and, of course, occupy the outer edges of the branches only. The body of the stipe throughout is moderately thin and flat; but, judging from the presence of a little pit in the shale at the place of each cell, the latter were inflated in form, so that their transverse diameter was considerably greater than the thickness of the stipe. Cells moderately large, each bearing upon its outer wall, just below the aperture, a slender, outward-projecting spine.

This species has almost exactly the general aspect of *G. ramosus* Hall, from the dark shales at Norman's Kill, near Albany, N. Y., and was at first regarded as identical with it; but, on close inspection, it is found to differ materially in the form of its cells and the character of the stipe. Some of these differences seem also to modify its relations to the subgenus *Climacograptus*, to which *G. ramosus* is assigned by Professor Hall, the author of the subgenus.

Position and locality.—Shales (probably of the age of those at Norman's Kill, near Albany, N. Y.), five miles north of Belmont, Nevada, where it is associated with the two species last described.

Besides the foregoing species of Graptolites, which are referred with some doubt to the Trenton period as defined by Dana, other localities

have furnished species that undoubtedly belong to that period, of which the following is a list:

Chonetes lycoperdon Say, Silver Cañon, Nevada.

Zaphrentis —? Silver City, New Mexico.

Favosites —? Silver City and Upper Miembres Mining Camp, New Mexico.

Favistella stellata Hall, Silver City, New Mexico.

Leptena sericea Sowerby ?, Silver City, New Mexico.

Strophomena planumbona Hall, Silver City, New Mexico.

Orthis biforata Schlotheim, Silver City, New Mexico.

Orthis occidentalis Hall, Silver City, New Mexico.

Orthis testudinaria Dalman ?, Silver City, New Mexico.

Orthis plicatella Hall ?, Fossil Butte, near Hico, Nevada.

Modiolopsis —? Upper Miembres Mining Camp, New Mexico.

Maclurea —? head of Amargosa Desert, Nevada (not *in situ*).

Euomphalus trochiscus Meek, Ewell's Spring, Arizona (lower horizon).

And also the following new species of *Rhynchonella* :

Genus **RHYNCHONELLA** Fischer.

RHYNCHONELLA ARGENTURBICA (*sp. nov.*)—Shell rather below medium size, compact, subtriangular in outline; length and width nearly equal; maximum height in old shells nearly equaling the width; postero-lateral margins somewhat straightened or slightly convex; rostral angle from forty to forty-five degrees; antero-lateral margins rounded; front sinuous or truncate, as seen by either dorsal or ventral view. Dorsal valve more convex than the ventral, abruptly arching to the beak, which is strongly incurved; mesial fold very prominent, distinctly defined back to the umbonal region, divided into either three or four prominent, angular, or sharply-rounded plications; sides regularly arching to the margins both transversely and longitudinally, but become somewhat laterally flattened near the beak; each marked by from five to seven plications; those nearest the mesial fold being of about the same size as those upon it, but they become smaller toward, and obsolete upon, the postero-lateral margins.

Ventral valve less strongly arched than the other; beak prominent; mesial sinus deep, occupying about one-half the width of the shell at the front margin; its sides abrupt, and the bottom having either two or three plications like those of the dorsal fold; sides sloping away from the edges of the sinus with less convexity than the sides of the dorsal valve have, and become laterally compressed near the beak; plications about seven on each side, becoming smaller toward, and finally obsolete upon, the postero-lateral spaces.

Besides the plications, which are continued to the beaks, the surface is marked by lines of growth, which are most prominent upon the plications, giving them a delicate cancellated appearance on some shells.

Length and breadth, about one centimeter; height, about eight millimeters.

Position and locality.—Strata of the age of the Cincinnati group, Silver City and Upper Miembres Mining Camp, New Mexico.

CARBONIFEROUS.

SUBCARBONIFEROUS PERIOD.

POLYPI.

Genus FAVOSITES Lamarck.

FAVOSITES WHITFIELDI White and Whitfield (manuscript).—This species, described by White and Whitfield, from the Subcarboniferous rocks at Burlington, Iowa, without a specific name, (Proc. Bost. Soc. Nat. Hist., vol. VIII, page 306), is identified among the collections made from the upper horizon at Ewell's Spring, Arizona.

BLASTOIDEA.

Genus GRANATOCRINUS Troost.

GRANATOCRINUS LOTOBLASTUS (*sp. nov.*)—Body subelliptical; greatest width about the middle; distinctly, but not very deeply pentalobate at the base, truncate at top; base depressed; basal plates very small; radial plates apparently very short, and embracing only the lower extremities of the pseudambulacral areas; interradial plates long and narrow, apparently reaching the summit; a comparatively shallow, vertical furrow along the center of each; anal plate prominent at its upper end; pseudambulacral areas prominent, narrow, reaching down to or below the plane of the basal plate, as seen by side-view.

Height, nine millimeters; transverse diameter, seven millimeters.

The aspect of this species is much like that of *G. melo* Owen and Shumard, from the Subcarboniferous rocks of Burlington, Iowa; but it differs in its less robust form, and in not possessing the distinct longitudinal lobes of that species. In that species, the pseudambulacral areas are depressed, while in this they are the more prominent portions in the outline of the body.

Position and locality.—Strata of the Subcarboniferous period, Ewell's Spring, Arizona.

CRINOIDEA.

Genus PLATYCRINUS Miller.

PLATYCRINUS —?—Upon the weathered surface of a piece of limestone in the collection, there are three or four more or less imperfect crinoids, partly imbedded in the rock, and partly defaced by weathering. One of these is a *Platycrinus*, as shown by characters other than the body-plates, which cannot be distinguished. The outline of the calyx is clearly shown; it is broad, cup-shaped; base depressed at the center; arms branching two or three times; branches slender; the whole upper part of the body prolonged into a proboscidiform mass, about three times the height of the calyx, and standing erect between the arms. Stem slender, composed of joints of unequal size.

This species resembles *P. laevis* Miller, as figured by De Koninck and le Hon (Recher. Crin. du Terr. Carb. de la Belgique), but is not so robust. The observable details indicate that it is a different, and proba-

bly a new species. In case other discoveries should prove it to be so, I propose for it the name of *P. vexabilis*.

Breadth of the calyx, about eight millimeters; height, five millimeters; height from base to top of proboscis, two centimeters; the arms were capable of extending about one centimeter farther.

Position and locality.—Strata of Subcarboniferous age, Mountain Spring, Old Mormon road, Nevada.

Genus ACTINOCRINUS Miller.

ACTINOCRINUS VIATICUS (*sp. nov.*)—Body below the arms broadly subturbinate; arms slender, somewhat compressed laterally; apparently thirty in all, since the two full rays and one-half of another that are in view bear such proportionate numbers. The appearance of branching of each ray begins below the periphery of the body, where, starting as a single pair, they immediately bifurcate; the two inner branches bifurcating again at or just beyond the periphery, the two outer branches remaining simple.

Surface of the body-plates marked by sharp, radiating ridges, which give the whole surface below the arms a confused cancellated appearance.

Width of body at its periphery, about eighteen millimeters.

Position and locality.—Strata of the Subcarboniferous age, Mountain Spring, Old Mormon road, Nevada.

BRACHIOPODA.

Genus SPIRIGERA d'Orbigny.

SPIRIGERA MONTICOLA (*sp. nov.*)—Shell subelliptical or subtetrahedral in outline, always wider than long, widest about the middle or a little forward of it, moderately gibbous; convexity of valves nearly equal; postero-lateral margins thickened in old shells, but in younger ones the whole margin is more or less sharp; front margin only slightly sinuous in very young shells, but very deeply sinuous in some old ones.

Ventral valve broadly convex from side to side, regularly arching from beak to front; beak moderately prominent and slightly incurved; foramen as usual, round, rather small; mesial sinus scarcely apparent in young shells, but in some old ones becoming very deep at the front, somewhat narrow, but moderately well defined at the sides.

Dorsal valve gibbous in the umbonal region, prominent along the middle, from which the sides slope away by gentle convex curves to the lateral margins; mesial fold in some specimens not well defined nor very prominent, in which cases the valve has a broad convexity, but in others the mesial fold is well marked, narrow, and very prominent at the front of the shell, while in all it is hardly traceable behind the middle, even in adult shells.

Surface of both valves marked by fine concentric lines or lamellæ of growth, and occasionally indications of fine radiating striæ are to be seen under the lens.

Length of a mature specimen, twenty-three millimeters; extreme width, twenty-nine millimeters; height, sixteen millimeters.

Position and locality.—Strata of the Subcarboniferous period, Mountain Spring, Old Mormon road, Nevada.

Besides the foregoing new species, the collection also contains the following, which have heretofore been described from Subcarbonif-

erous strata, and to which period I have referred the rocks from which the specimens were collected. The first line gives the localities of the specimens contained in the collections, and the second those Subcarboniferous localities which furnished the types of all the species named except one.

Syringopora Harveyi White?

Ewell's Spring, Arizona.

Burlington limestone, Burlington, Iowa.

Productus Parvus Meek and Worthen.

Mountain Spring, Old Mormon road, Nevada.

Chester limestone, Chester, Illinois.

*Strophomena rhomboidalis** Wilkins.

Mountain Spring, Old Mormon road, Nevada.

Kinderhook formation of Illinois and Iowa and elsewhere.

Spirigera obmaxima McChesney.

Mountain Spring, Old Mormon road, Nevada, and below Ophir City, Utah.

Keokuk limestone of Iowa and Illinois.

Spirifer (Martinia) peculiaris Shumard.

Mountain Spring, Old Mormon road, Nevada.

Kinderhook, formation of Missouri and Iowa.

Spirifer centronata Winchell.

Mountain Spring, Old Mormon road, Nevada.

Waverly sandstone, Cuyahoga Falls, Ohio.

Spirifer striatus Martin.

Mountain Spring, Old Mormon road, Nevada.

Burlington limestone (*S. Grimesi*), Burlington, Iowa.

Spirifer (Syringothyris) extenuatus Hall.

Mountain Spring, Old Mormon road, Nevada.

Kinderhook formation of Iowa and Missouri.

Terebratula Burlingtonensis White.

Mountain Spring, Old Mormon road, Nevada.

Kinderhook formation, Burlington, Iowa.

Productus Prattenianus Norwood (=? *P. laevicostus* White).

Below Ophir City, Utah.

Kinderhook formation, Burlington Iowa (*P. laevicostus*).

Orthis Michilini var. *Burlingtonensis* Hall?

Below Ophir City, Utah.

Burlington limestone, Burlington, Iowa.

CARBONIFEROUS† PERIOD.

ECHINODERMATA.

Genus ARCHÆOCIDARIS McCoy.

ARCHÆOCIDARIS TRUDIFER (*sp. nov.*)—Interambulacral plates comparatively broad, rather thin, with a row of small tubercles forming an elevated border all around; areolar surface apparently plain; central tubercle small, perforated in the center, surrounded at its base by a

* Almost world-wide in its distribution, but is believed not to exist in strata of later date than the Subcarboniferous.

† I use this term to indicate all the strata between the Subcarboniferous below and the Permian above, and especially in contradistinction to the Subcarboniferous; in other words, it is used as synonymous with the general term "Coal-Measures," somewhat in use.

very slightly-raised ring, and immediately outside of that, by another one so much elevated as to form a little cup, with a somewhat expanded rim. Diameter of the largest plate in the collection, about twenty millimeters.

Spines very long, slender, one of the specimens having been, when perfect, about eleven centimeters in length, terete; diameter at the basal ring, which expands abruptly from the shaft, much greater than any portion of the latter; shaft continues of nearly uniform diameter for more than half its length from the ring, and then gradually tapers to a point. Greatest diameter of the shaft of the long spine referred to, scarcely five millimeters; diameter of the basal ring, seven millimeters. Surface of the spine for a short distance above the basal ring apparently smooth, but from that portion to the distal end it is ornamented with numerous small points or incipient spinules. These are often removed by weathering; but in well-preserved specimens they are quite distinct, and are seen to be arranged in imperfectly spiral lines around the spine.

Position and locality.—Carboniferous strata, Camp Apache, Arizona.

POLYZOA.

Genus GLAUCONOME Goldfuss.

GLAUCONOME NEREIDIS (*sp. nov.*)—Polyzoary branching, the main stem sending off branches at irregular intervals, these in like manner sending off secondary branches less frequently; the stem and all branches bearing branchlets of the usual character in regular series at each side, all of which are straight or a little curved; branches leaving the stem, and branchlets the stem and branches, at nearly or quite uniform angles of between sixty and seventy degrees; branchlets opposite or irregularly alternating, the intervals between them being a little greater than the diameter of the branchlets; non-poriferous side of the stem, branches, and branchlets convex and marked by fine, longitudinal striae; poriferous side of stem and branches bearing a row of pores along each of their lateral borders, the number of pores being about twice as great as that of the branchlets, but they are not placed in perfectly regular order with them. The space between these two lateral rows of pores is convex, and marked by scattered, dimorphous pores, which are not more than half as large as those of the lateral rows. Branchlets bearing a row of pores at each lateral border of the poriferous side, which are a trifle smaller than the lateral pores of the stems, and which, having prominent borders to their apertures, give the branchlets a somewhat knotted appearance.

There is considerable difference in the size of the broken stems and branches among the specimens; but none of them, not even the longest fragment, perceptibly diminishes in size toward the distal end. The largest stem is about half a millimeter in diameter, and the smallest not more than half that size.

The branchlets are from one to three millimeters in length.

The whole extent of the branching of a polyzoary of this species is unknown. The branches are merely excessively developed branchlets, each occupying the place of one of them. As soon as a branchlet reached beyond the ends of those upon either side of it, it began to throw off branchlets from each of its own sides and became a branch. In a few cases, these first branchlets of the new branch have joined with the adjacent branchlets of the stem, forming a few irregular fenestrae.

This species differs from *G. trilineata* Meek in being much branched,

in the presence of dimorphous pores upon the axial portion of the poriferous side of the stems and branches, and in the absence of the three longitudinal, raised lines, which distinguish that species.

Position and locality.—Carboniferous strata at the confluence of White Mountain and Black Rivers, Arizona.

Genus POLYPORA McCoy.

POLYPORA STRAGULA (*sp. nov.*)—Polyzoary apparently flabelliform; longitudinal branches bifurcating with more or less irregularity in different parts of the polyzoary; dissepiments little, if any, more than half as wide as the branches; fenestrae oval or oblong, the proportions of length and width varying in different parts, from about one-quarter longer than wide to twice as long as wide. Poriferous side of branches furnished with from four to six rows of small, thick-set pores of uniform size, arranged more nearly in rows obliquely than vertically. Dissepiments bearing a couple of pores near their junction with the branches, and rarely one or two others along their middle portion, which is often slightly ridged.

Fenestrae varying in size in different parts of the polyzoary, but average about six longitudinally in the space of a centimeter.

This species occurs in the Upper Coal-Measures of Iowa, Missouri, and Nebraska, and is the one referred to by Dr. Geinitz, (Carbonformat. und Dyas in Neb.) to *Polypora biarmica* Keyserling.

Position and locality.—Carboniferous strata, confluence of White Mountain and Black Rivers, Arizona.

BRACHIOPODA.

Genus CHONETES Fischer.

CHONETES PLATYNOTA (*sp. nov.*)—Shell rather under average size, transversely suboval or indistinctly four-sided; hinge-line usually about equal to the greatest width of the shell, often slightly exceeding it, and occasionally shorter.

Ventral valve moderately convex, flattened a little toward the hinge-extremities, without a proper mesial sinus, but, in place of it, there is a mesial flattening or slight bending-upward, at the front only, which straightens the front border a little; beak not prominent; area of moderate width wider than that of the dorsal valve, bearing on its posterior margin five or six rather small oblique tube-spines upon each side of the beak.

Dorsal valve almost flat, oftener a little convex than concave, especially from side to side; mesial fold represented only in adult shells, and in them merely by a very slight elevation of the front, causing its margin to follow that of the ventral valve in a gentle sinuosity; surface of both valves marked by numerous fine, obscure, radiating striae and occasional imbricating lines of growth.

This species is readily distinguished from others by its flat or slightly convex dorsal valve.

Length, nine millimeters; width, twelve millimeters.

Position and locality.—Strata of the Carboniferous period, near Santa Fé and near Salt Lake, New Mexico.

Genus RHYNCHONELLA Fischer.

RHYNCHONELLA WASATCHENSIS (*sp. nov.*)—Shell under medium size, sublenticular or subglobose; valves nearly equally convex; length

equal to or slightly greater than the breadth; antero-lateral and front margins somewhat regularly rounded, the front being slightly straightened, or a little emarginate; postero-lateral margins converging to the beaks at an obtuse angle.

Dorsal valve broadly convex from side to side; convexity from beak to front regular, but a little greater than the transverse; umbo prominent; beak strongly incurved; mesial fold obsolete or entirely wanting.

Ventral valve strongly and somewhat regularly arching from beak to front; convexity from side to side a little less than the longitudinal, and about equal to the transverse convexity of the other valve; beak somewhat prominent and incurved over the beak of the dorsal valve; mesial sinus obsolete or wanting.

Surface marked by a few obscure, radiating striæ, which are most conspicuous near the median line of each valve. Fine, concentric striæ are numerous; and in adult shells there are also strong imbricating lines of growth near the front and lateral margins.

Length, fifteen millimeters; width, fourteen millimeters; height, twelve millimeters.

This shell has a different aspect from any other species of *Rhynchonella* in the Carboniferous rocks, and some doubts are felt as to its proper reference to that genus; but the broken ventral beak shows no other characters than those of *Rhynchonella*, and the shell-structure is not punctate but distinctly fibrous.

Position and locality.—Carboniferous rocks, Rock Cañon, Wahsatch range near Provo, Utah.

RHYNCHONELLA METALLICA (sp. nov.)—Shell rather small, depressed, or moderately inflated when adult, transversely suboval in outline; antero-lateral borders abruptly rounded; front broadly rounded and scarcely emarginated; postero-lateral margins straightened, laterally compressed, and meeting the beaks at a very obtuse angle.

Dorsal valve more capacious than the ventral, broadly convex from side to side, a little flattened near the beak, abruptly bent downward at the margins; mesial fold broad, not much elevated, discernible only on the anterior part of the valve.

Ventral valve comparatively shallow, slightly convex from side to side, and the same also from the umbo to the antero-lateral margins; beak small, prominent, and incurved over that of the dorsal valve; mesial sinus broad, becoming obsolete near the middle of the shell.

Surface marked by from fourteen to sixteen simple angular plications upon each valve, with angular interspaces of similar width between them, all of which are continuous to the beaks; about four of these are borne in the mesial sinus, and five upon the mesial fold.

Length, ten millimeters; breadth, twelve millimeters; height, seven millimeters.

This species resembles *R. Cooperensis* Shumard from the Subcarboniferous strata of Missouri, but differs in having a less number of plications, and in wanting the numerous filiform, radiating striæ of that shell.

Position and locality.—Strata of the Carboniferous period, Old Potosi mine, Lincoln County, Nevada.

Genus *SPIRIFER* Sowerby.

SPIRIFER (MARTINIA) GLABER var. CONTRACTA Meek and Worthen.—The collection contains specimens from Camp Cottonwood, Lincoln County, Nevada, that I am unable to separate from the above-named

species. The specimens were associated with the characteristic Carboniferous or Coal-Measure species, while the type-specimens of Meek and Worthen were obtained from the Chester limestone of the Subcarboniferous series in Illinois.

Genus **SPIRIFERINA** d'Orbigny.

SPIRIFERINA SPINOSA var. **CAMPESTRIS**.—The collection contains specimens of a species of *Spiriferina* from near Santa Fé, New Mexico, and Camp Cottonwood, Lincoln County, Nevada, that correspond in all essential respects with *S. spinosa* Norwood and Pratten, except that the specimens show none of the minute spines of that species. These specimens were found associated with species that are characteristic of the Upper Carboniferous period, while theirs were collected from the Chester limestone of Illinois of the Subcarboniferous series. It seems probable that both this and the foregoing species survived from the Subcarboniferous to the Upper Carboniferous period, with comparatively little change.

Genus **DIELASMA** King.

DIELASMA ? BOVIDENS Morton (*sp.*) The species, so widely distributed in the Carboniferous rocks of the United States, and so widely known under the names of *Terebratula bovidens* Morton and *T. millipunctata* Hall, is among the collections associated with species that are its common associates elsewhere. It is found to possess comparatively strong dental plates extending the full length of the ventral beak, and also a reflexed loop extending farther forward than the middle of the shell. The exact details of the loop have not yet been made out; but I have at present but little doubt that the shell in question belongs to genus *Dielasma* King.

CONCHIFERA.

Genus **AVICULOPECTEN** McCoy.

AVICULOPECTEN COREYANA (*sp. nov.*)—Shell moderately large; width not exceeding, or a little less than, the height; margin of the basal half forming almost a true semicircle; posterior margin thence continued straight and parallel with the axis of the shell about half-way to the cardinal margin, then curving outward, it forms with the last-named margin a somewhat acute angle. Hinge-line a little longer than the full width of the shell, at right angles with its vertical axis, projecting farther backward than the posterior border, but not reaching quite so far forward as the anterior border.

Left valve convex, most so in the umbonal region; beak prominent, not projecting beyond the cardinal border; posterior ear moderately large, acutely angular at the outer extremity, not distinctly defined from the body of the valve; anterior ear defined by a moderately deep byssal sinus and a distinct depression running from it to the beak, not so prominent as the other; its outer border rounding downward and inward from the cardinal border into the byssal sinus, where it is met by the incurving anterior border of the body of the valve.

Surface marked by numerous fine, radiating costæ of unequal size, which are in turn marked by very fine radiating striae, all crossed by fine, concentric lines of growth and occasional coarser lines of increment. Upon the posterior ear, the radiating costæ are obsolete; but upon the

anterior ear, they are coarser than those of the body of the valve, and somewhat corrugated. Right valve unknown.

The specimens are all broken in some parts, but the height, antero-posterior breadth, and length of the hinge-line all seem to be about equal—about six centimeters in the largest example.

This shell somewhat resembles *A. occidentalis* Shumard, but differs in its greater proportionate width, in being less contracted below the ears, its less distinctly defined posterior ear, its finer and more unequal costæ and greater size.

Position and locality.—Carboniferous strata, east of Mount Taylor, one mile south of Pajuate, New Mexico.

Genus MONOPTERIA Meek and Worthen.

MONOPTERIA MARIAN (*sp. nov.*)—Shell nearly or quite equivalve, slender, much extended posteriorly, curved; curvature greatest in the anterior half of the shell; posterior half nearly straight; body gradually tapering to near the posterior end, which is sharply rounded; a more or less prominent angle is sometimes, in part, raised as a distinct carina, which extends along the middle of the body of each valve from the beak to the posterior end; from this carina or angle the sides slope abruptly to the inferior and upper borders, so that a section of the shell behind the ear would give a rhomboid outline. Beaks moderately prominent, separate; hinge equal in length to about half the full length of the shell, and its direction nearly parallel with the posterior half of the body; posterior wing well developed, not sharply defined from the body; cardinal portion moderately extended; anterior ear obsolete; lunule moderately large and deep, its margins sharply rounded.

Surface somewhat smooth in appearance, but is marked by very numerous fine lines of growth.

Length from front to posterior extremity, four centimeters; height from base to hinge-margin, eighteen millimeters; average width of the body of the shell, about one centimeter.

This shell is related to *M. longispina* Cox (*sp.*) but differs from that species in its more slender and less deeply-curved body, and in having a much shorter ear-spine than the one represented in the figure given by Professor Cox.

Position and locality.—Strata of the Carboniferous period, Camp Apache, Arizona.

GASTEROPODA.

Genus MACROCHEILUS Phillips.

MACROCHEILUS ANGULIFERA (*sp. nov.*)—Shell of medium size, irregularly rhombic in outline by side-view; spire about equal to two-fifths the full height of the shell, acutely pointed; volutions six or seven, increasing somewhat rapidly in size, more or less convex; but in some cases the upper part of their sides is considerably flattened, and the upper portion of the volution squarely truncated to the suture, forming a distinct angle with the side. In other cases, the angle is less distinct; but it is perceptible in all, and in all the suture is distinctly impressed. When the angle is distinct, there is a well developed spiral shelf extending from the upper margin of the aperture to the apex. Aperture irregularly oval, more or less truncated above by the shelf referred to, effuse below; outer lip sharp; columella a little tortuous, or nearly on a

line with the axis of the shell. Surface apparently smooth, except the ordinary lines of growth.

Length of the largest specimen, thirty-six millimeters; width of last volution, twenty-three millimeters.

This shell differs from other species of *Macrocheilus* in the possession of such an angle as has been described at the upper part of the whorls.

Position and locality.—Carboniferous strata at Camp Cottonwood, Spring Mountain range, Nevada.

Genus DENTALIUM Linnæus.

DENTALIUM CANNA (sp. nov.)—Shell large, thin, straight or slightly curved; section circular or nearly so; surface marked by numerous encircling lines of growth crossed by fine, obscure, longitudinal striæ.

Our specimens indicate that individuals of this species reached a length of ten or twelve centimeters. The largest fragment measures nine millimeters in diameter at the base, and at a distance of five centimeters toward the apex, the diameter is six millimeters.

The great size of this species, together with its delicately-marked surface, clearly distinguishes it.

Position and locality.—Strata of the Carboniferous period, near Salt Lake, New Mexico, and near Relief Spring, Arizona.

MESOZOIC.

JURASSIC PERIOD.

CONCHIFERA.

Genus CAMPTONECTES Agassiz.

CAMPTONECTES STYGIUS (sp. nov.)—Shell of medium size, thin, lenticular; length of the hinge-line a little more than half the height of the shell from basal margin to beak, very slightly oblique with the axis, which inclines a little posteriorly, although it does not at first view appear to, because a trifle more than one-half the width of the shell is in front of it; the margins of the lower two-thirds regularly rounded, the basal portion having rather a shorter curve than either the anterior or posterior portion.

Right valve smooth, depressed-convex; posterior ear rather small, plain, its outer border forming a somewhat obtuse angle with the cardinal border; anterior ear moderately large, prominent, proportionally narrow, the upper and lower sides approaching each other at an acute angle; anterior border extending farther forward than the extremity of the anterior ear, at which part it is abruptly rounded and then continued backward and upward almost straight to the bottom of the byssal notch.

Surface nearly smooth, but concentric lines and striæ of growth are visible, and in a favorable light indications of radiating costæ may also be observed.

Height from base to beak, forty-one millimeters; width, forty millimeters; length of hinge-border, twenty-three millimeters.

This shell resembles *C. bellistriatus* Meek and Hayden, from the Jurassic strata of Dakota, but it differs in the outline of the borders, the shape of the ears and byssal notch, and in the surface-markings.

Position and locality.—“Edge of the bluff, fifteen to twenty miles south of Dirty Devil River, and upon the North Fork of Virgin River, Utah.” Rocks of Jurassic age.

GASTEROPODA.

Genus NERITINA Lamarck.

NERITINA PHASEOLARIS (*sp. nov.*)—Shell small, obliquely suboval; volutions apparently from two and a half to three and a half, the last one composing all but a very small portion of the whole surface in sight; aperture obliquely ovate, apparently not crenulated.

In some specimens, the convexity of the outer volution, from the base of the small elevated fold which is appressed against the spire, to the margin of the aperture, is quite regular, but in others this volution has a revolving, rounded prominence, a little nearer to the suture than the base, which causes a more or less conspicuous flattening at its side as well as a slighter flattening between the prominence and the suture.

Surface marked by moderately distinct lines of growth, and sometimes faint indications of revolving striae are also seen.

Greatest diameter of the oval outline of our largest specimen, thirteen millimeters; shorter diameter, ten millimeters; greatest height, lying with its aperture downward upon a table, eight millimeters.

Position and locality.—Strata of Jurassic age, Salt Creek, near Nephi, Utah, where it is associated with *Pentacrinus asteriscus* Meek and Hayden.

Genus ANCHURA Conrad.

ANCHURA NUPTIALIS (*sp. nov.*)—Shell small; body subfusiform; spire moderately prominent, acute, nearly or wholly incrusted by callus, so that the volutions are obscurely seen except where the callus is exfoliated; volutions about seven; revolving angle obscure upon the volutions of the spire, even when bared by exfoliation of the callus, but is more distinct upon the body-whorl, and ends in a slender, falciform prolongation of the lip. This prolongation diverges widely from the axis of the shell, but reaches nearly as far backward as the apex of the spire; anterior border of the lip with a prominent, rounded lobe, placed just forward of the base of the falciform process, and which is about as wide as that process is at its base; from this lobe, the border of the lip passes forward with a concave curve to the base of, and ends in, the long, slender, anterior canal. Aperture unknown.

Length from the apex of the spire to the end of the anterior canal, twenty millimeters; width, measuring across from the base of the falciform process of the lip, nine millimeters; spire, falciform process, and anterior canal, each about seven millimeters.

Position and locality.—Strata probably of Jurassic age, fifty miles north of Camp Apache, and five miles west of Mineral Spring, Arizona.

CRETACEOUS PERIOD.

CONCHIFERA.

Genus PINNA Linnæus.

PINNA PETRINA (*sp. nov.*)—Shell moderately large, broad, rather thick for a species of this genus, rapidly expanding in height as it increases in length; dorsal margin concave; ventral margin couvex; a more or less

strongly-raised carina extending from the break to the posterior margin, defining a prominent longitudinal angle along the median portion of each valve, a little nearer the ventral than the dorsal border; section rhomboidal, the sides of the rhomb being slightly convex; posterior margin oblique with the axis of the shell, forming a distinct but obtuse angle with the dorsal margin. The acute angle, which it would form with the ventral margin if it continued its direct course, is abruptly rounded.

Surface marked by strong, distinct lines of growth, which run obliquely downward and backward in a nearly direct course from the dorsal margin, across the mesial angle, to near the ventral margin, where they are abruptly flexed forward, and blend with the ventral border. Crossing the lines of growth upon the surface above the mesial angle, there are coarse but indistinct radiating striae and occasionally still more indistinct traces of similar ones below that angle, all of which are more discernible upon the anterior than upon the posterior part of the shell.

Some of the largest specimens measure seven and a half centimeters in width along the posterior margin, and they must have been not less than seventeen centimeters in length when entire.

The large size, proportionally great width, and angular aspect of this shell distinguish it from any other likely to be confounded with it.

Position and locality.—Strata of Cretaceous age, east of Mount Taylor, one mile south of Pajuate, New Mexico.

Genus CAMPTONECTES Agassiz.

CAMPTONECTES PLATESSA (*sp. nov.*)—Shell thin, suborbicular in outline; hinge-line equaling in length about one-half of the transverse diameter of the valves; ears sharply defined; posterior ear short, flat, its outer margin slightly concave; anterior ear moderately large, marked by radiating striae and concentric lines of growth.

The anterior ear of the right valve separated from the body-portion by a deep, rather narrow, and somewhat angular sinus, which is about one-half as deep as the length of the ear from its outer extremity to the beak.

Radiating striae fine, distinct, increasing in number so rapidly that the direction of the outer ends of those behind the middle of the shell is transverse, and farther posteriorly they are even distinctly recurving; the radiating striae crossed by fine, concentric striae, and occasionally by more distinct lines of growth.

Height and length, each about forty-five millimeters.

Position and locality.—Strata of Cretaceous age, fifty miles north of Camp Apache, and five miles west of Mineral Spring, Arizona.

Genus INOCERAMUS Sowerby.

INOCERAMUS DIMIDIUS (*sp. nov.*)—Shell very small, thin, inflated, sometimes much so, obliquely subovate in outline; valves subequal, the left one being somewhat more capacious than the right; beaks small, prominent, acute, incurving, and pointing a very little forward; hinge-line straight or nearly so, rather short.

Surface marked by more or less regular and more or less strong folds or undulations, which in some cases exist on only the upper portion of the shell, the remainder being smooth or marked only by fine, concentric lines of growth. This cessation of, or irregularity in, the formation of the concentric folds was sometimes connected with considerable distortion of the usual symmetry of the shell.

Greatest length of a fair average specimen, from the umbo to the postero-ventral margin, twenty-six millimeters; thickness, sixteen millimeters.

This species is distinguished from others of the genus by its small size, prominent, pointed beaks, and subequal valves. From the young of *L. problematicus*, it is distinguished by the usual characteristics of mature growth.

Position and locality.—Strata of Cretaceous age, Ojo del Pescado, New Mexico.

Genus **LEIOPISTA** Meek.

Subgenus *Psilomya* Meek.

LEIOPISTA (PSILOMYA) MEEKII (*sp. nov.*)—Shell short, much inflated; umbones large, elevated; beaks small, strongly curved inward and downward, and very slightly turned forward; posterior portion moderately produced, somewhat compressed laterally; the free margins forming a regular but unequally convex curve, the greatest convexity being in front, and the least along the base; upper portion of the posterior border obliquely truncated, so that the greatest posterior extension of the shell is a little below the hinge-extremity.

Surface smooth in general aspect, but it is marked by fine-concentric lines of growth. Under a lens, very fine, obscure, radiating striæ are seen upon a little more than the anterior half of the shell; and upon the remainder of the surface, except a small portion adjoining the posterior cardinal border, there are small, somewhat distant, radiating striæ, easily seen by the unassisted eye. Upon these striæ, both the distinct and obscure, the lens shows numerous minute punctures, placed at irregular intervals, which are the bases of minute, short, blunt spines, or mark the places from which they have been removed.

Length, twenty-five millimeters; height, from base to umbo, twenty millimeters; greatest thickness, both valves together, sixteen millimeters.

This shell seems to be more nearly related to *L. globosa* (*=Poromya globosa* Forbes,) than to any other described species. Compared with that species, as figured and described by Stoliczka (Cretaceous Fauna of Southern India, volume III, page 47, plate III, fig. 8; and plate XVI, fig. 16), this specimen differs in being less globular, in having the umbones more elevated, and in the more distinct, radiating striæ upon the posterior half of each valve.

This species belongs to an interesting group of shells, embraced within the family *Anatinidae*, which Mr. F. B. Meek has defined under the generic name of *Leiopista*, of which genus he regards the *Cardium elegantulum* of Roemer as the type. He has also divided the genus into three sections or subgenera, under the names of *Leiopista* proper, *Cymella*, and *Psilomya* (the latter yet in manuscript). The species here described is regarded as a typical one of the last-named subgenus. The completeness and precision with which that distinguished paleontologist has done the work upon this group of shells reflect great credit upon the science, and it affords me pleasure to name this species in his honor.

Position and locality.—Strata of Cretaceous age, southeast of Paria, Utah.

GASTEROPODA.

Genus CASSIOPE Coquand.

CASSIOPE WHITFIELDI (*sp. nov.*)—Shell large, elongat-econical, umbilicate; volutions apparently about twelve, prominent, and prominently angular below the middle of the visible portion, slightly concave from the prominent revolving angle to the suture below, also very slightly and somewhat irregularly concave from that angle to the suture above. A little below the suture there is a rather small, shallow furrow, with its borders; above and below, raised into more or less distinct, revolving ridges.

Upon the under side of the last volution, which is rather strongly convex, there are three small revolving ridges, one of them bounding the umbilicus, the other two near each other above the middle of the space and continuous to the apex of the shell. It is between the two last-named ridges that the upper edge of each succeeding volution joins the preceding one. Umbilicus moderately large and deep; aperture subovate in outline; outer lip sinuate, having a broad, shallow notch above its middle, projecting and rounded abruptly into the umbilicus below.

Surface marked by more or less strong, undulating lines of growth, fine, revolving lines absent or obscure.

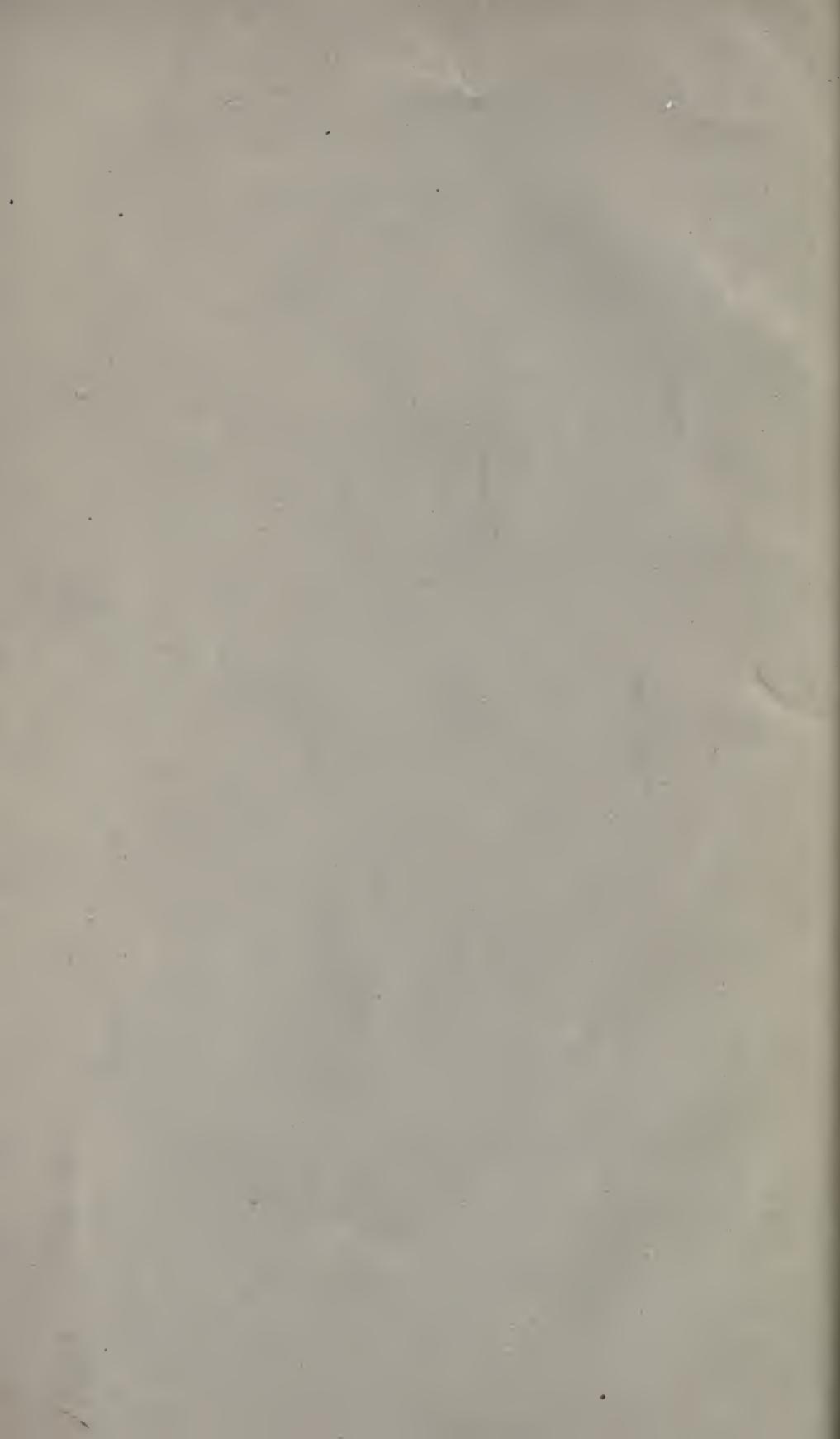
Diameter of the last volution of our largest specimen, nearly four and a half centimeters; the full height of the same, when entire, must have been not far from eleven centimeters.

This shell more nearly resembles *Turretella Mortoni* Conrad in general aspect than any other described species; but the presence of an umbilicus separates it generically from that shell.

Dedicated to Mr. R. P. Whitfield, the accomplished palaeontologist of Albany, N. Y.

Position and locality.—Cretaceous strata, at the head of Le Verken Creek, and also in Pace's Cañon, Utah.





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